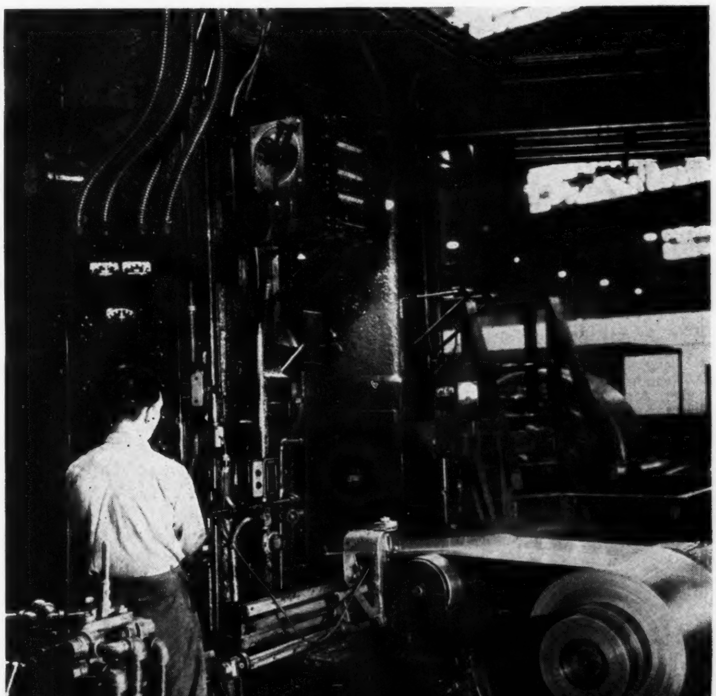
The CORNELL ENGINEER



In This Issue:

Our New Dean --- *S. C. Hollister*

Volume 3 DECEMBER, 1937 Number 3

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(right)

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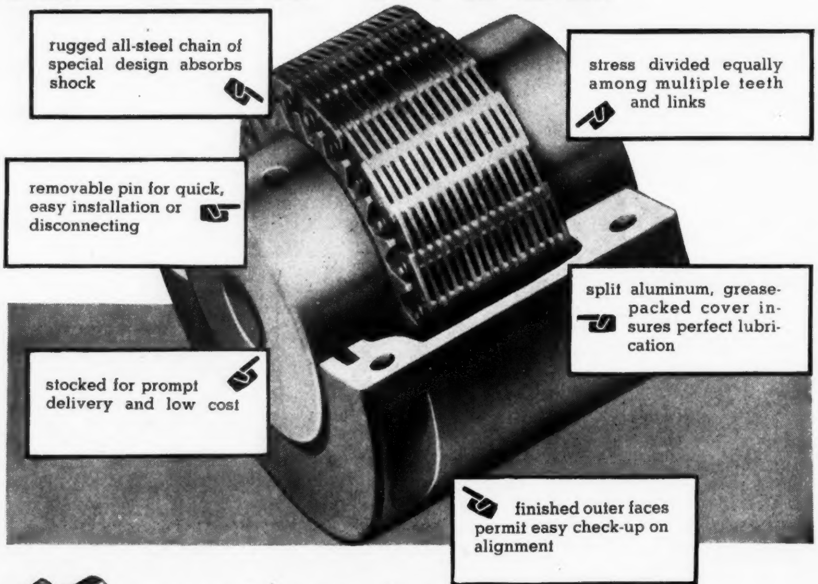

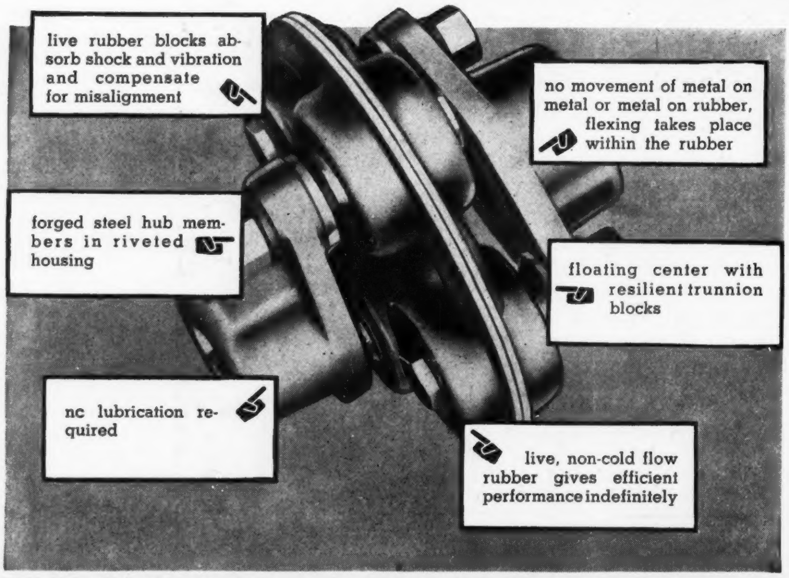

MORSE MORFLEX COUPLINGS
(left)

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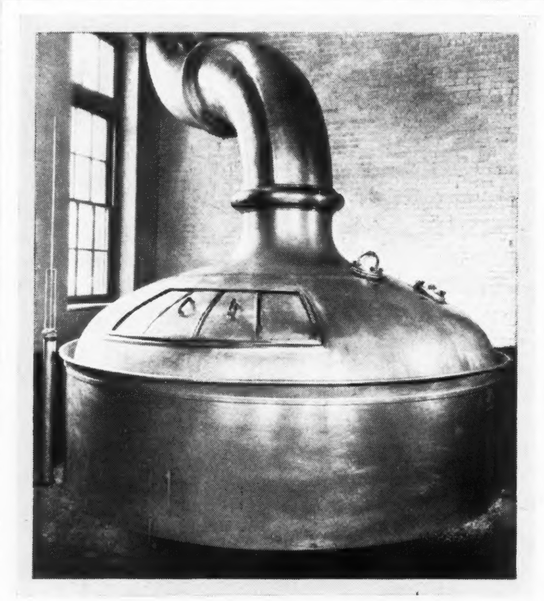

Tomorrow's engineers will be expected to know how to take advantage of this modern metalworking process. Several valuable and interesting technical booklets, which describe the application of the oxy-acetylene process of welding and cutting to design, construction and fabrication, are available from Linde offices in principal cities. Write to The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York, N. Y.

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THE CORNELL ENGINEER

PUBLISHED MONTHLY DURING THE COLLEGE YEAR

Volume 3 | DECEMBER, 1937 | Number 3

COMMENTS

We present some new and interesting sidelights on Dean Hollister and his background including Mr. Arthur R. Lord's description of 'Holly'.

Prof. Karapetoff's plea for a more rounded engineer is in line with the evolution of the creature.

Mr. Howes describes the program of activities at the first Regional Foundry Conference of the American Foundrymen's Association, held at Cornell on November 26 and 27.

The government in engineering happily combines utility and protection under the TVA. The plans and workings of this project are summarized for us by our Associate Editor, Aaron H. Sullivan.

Prof. Thatcher traces the historical development of water rights and law in his article on "Modern Water Law."

For the lesser lights and uninformed we include a list of the undergraduate societies in the Engineering College and the officers thereof.

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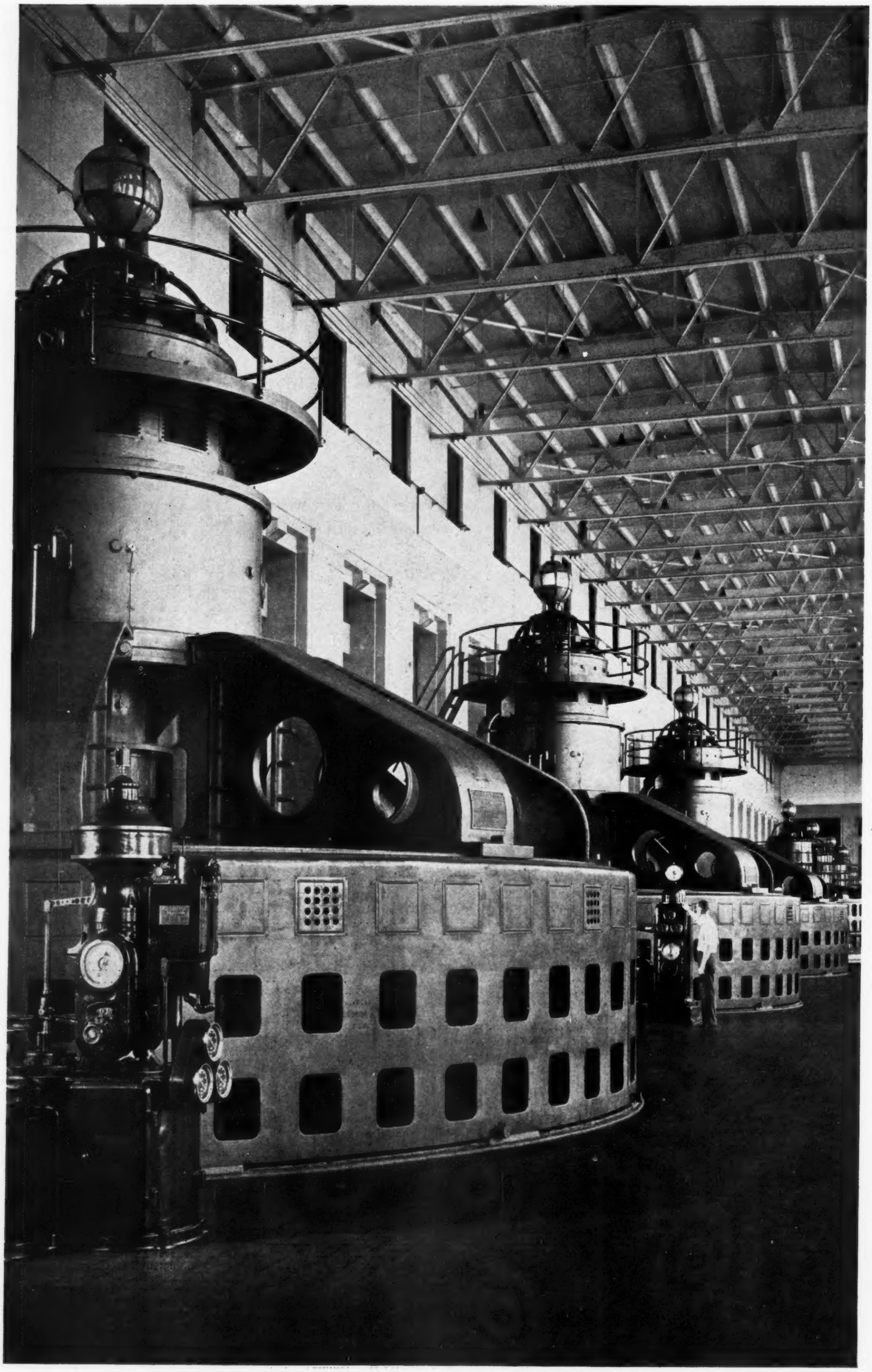


Generators in use at the Wilson Dam *-Courtesy TVA*

The CORNELL ENGINEER

Volume III DECEMBER, 1937 No. 3

Our New Dean --- *S. C. Hollister*

Professor S. C. Hollister was named dean of the College of Engineering by action of the University Board of Trustees late in October. Director of the School of Civil Engineering since July, 1934, he had been associate dean of the College for a year and acting dean for two months following the death of Dean Herman Diederichs in August, 1937. Dean Hollister assumes his new duties with a background of significant achievement in engineering practice and education.

After graduating from the University of Wisconsin in 1916 with a B.S. in C.E. degree, he taught for a year at the University of Illinois, served for two years with the U. S. Shipping Board, and spent ten years in private practice before returning to academic life as professor of structural engineering at Purdue in 1930.

Dean S. C. Hollister

Dean Hollister has long been active in such organizations as the American Society of Testing Materials, the American Railway Engineering Association, the American Society of Civil Engineers, and the American Society of Mechanical Engineers. He was first president of the Indiana section of the A.S.C.E., is a past president of the Ithaca section, and was a member of the national executive committee of the structural division of the society in 1921-22.

Since 1919 he has held a continuous membership on the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, representing six national societies. He is also a member of the Reinforced Brick Masonry Research Board, which serves the entire brick industry, and of the Committee on Specifications for Welded Steel Bridges, an organization set up by the American Welding Society. He is chairman of the Advisory Committee on Water Resources of the New York State Division of Planning, and was president of the American Concrete Institute from 1932-1934.

He has continued to act as consulting engineer on various important projects, such as the construction of the penstock for Boulder Dam and the strengthening of the Walnut Street Bridge over the Susquehanna River at Harrisburg. As an expert combining wide theoretical knowledge with extensive practical experience, he has been much in demand as a contributor to engineering journals. His paper on "The Design and Construction of a Skew Arch" won the Wason Research Medal in 1929. He has written chapters on reinforced concrete and masonry structures and plain and reinforced concrete for standard textbooks in Civil Engineering.

A revealing personal sketch of Dean Hollister by Arthur R. Lord, prominent consulting engineer of Chicago, appeared in the Proceedings of the American Concrete Institute in 1932. "The most disconcerting thing about S. C. Hollister," he wrote, "is his youth. Destined next month to become the Institute's tenth and youngest president, he brings to his new responsibilities not only youth in the mere matter of years, but corollary attributes — the animation and spirit of youth and a warm and contagious interest in a wide range of subjects of great diversity.

"He comes into my office and starts to disclose his latest mathematical 'shortcut' (his expression, not mine) in structural design, using a jargon of mixed Greek, Roman and Hindu symbols, the prelude to aspirin. In a few minutes he has switched to 'liveable' concrete houses, of which he has architected not a few, and thence to his latest concept of the essentially colloidal action of hydrating cement; to tests of transit mixers and to studies of wind torques and pressures on models in wind tunnels.

"His activity will never be confined to the campus, for Holly is a salesman ever—with the higher salesmanship of ideas which is the gift of a colorful, spritely, omnivorous mind, looking at old concepts and practices in new and illuminating ways."

The Enlarging Concept of Engineering

Vladimir Karapetoff

Professor of Electrical Engineering

Professor Vladimir Karapetoff

In proportion as the concept of "laws of nature" grows larger to include individual human behavior and group action, the engineer is called upon to apply his time-tested methods to broader problems of state and country. The usual definition of engineering, as the science and art of applying laws of nature to human needs, still holds; only the laws of nature cannot any longer be limited to those of levers and expanding steam. Sales engineering and works management have been the two windows through which the mechanistically-minded engineer has been made to see broader aspects of his profession, involving fickle human will, prejudices, and emotional response. It is true that these propensities cannot yet be predicted with the same accuracy as the strength of a beam or the behavior of an electric generator, but the engineer has always included a lot of intuitive art (horse sense) as a part of his professional make-up anyway. As the laws of human behavior become better known we may expect an ever-increasing influence of properly-trained engineers upon our political, economic, and social life.

A person who can play fragments of half a dozen pieces on the piano in a crude fashion is not a musician worthy of that name. The new engineer whom I am picturing is not a man who barely has had short courses in elementary psychology and economics, in addition to his big courses in machine design and laboratories. My plea is primarily for a longer college course, following the example of the professions of law and medicine. Our nation must be awakened to the great possibilities of scientific planning and systematic gradual realization of an all-embracing economic and social program, a plan that would carry us as little scathed as possible beyond the present unrest and uncertainties. The men and women who know what is needed and what is possible to accomplish to save this country from a chaos do not yet call themselves engineers. They may be historians, sociologists, economists, psychologists, or what not. But once they are called upon to lay down definite plans and to execute them, they become engineers, for they will have to employ practically the same rigid methods of design and management as those used in building a mammoth bridge or running a huge automobile plant. Thus, these human engineers of the new kind should have considerable general engineering ability and training, and at the same time be experts in one of the lines of "social engineering." An analogy with a medical specialist readily suggests itself.

I am unalterably opposed to anything superficial in engineering training in colleges, for with the present spread of popular information superficial knowledge is readily picked up from the daily and weekly press and by simply keeping one's eyes open. The ranks of the new engineers should not be filled from among so-called practical youths who cannot master mathematics. The social engineer has to be even more analytical than his older mechanistically inclined colleague, for he is to apply himself to much more difficult problems and to problems whose solution cannot be looked up in a vade-mecum, like the size of an I-beam. The only choice left is to lengthen the course of training to five or even six years. No student should be allowed to specialize for at least three years; during these years he should be imbued with the general point of view of an engineer, using as illustrations some simple problems taken from two or three usual domains of engineering activity. This means a training both in the fundamental sciences and in applied situations. From there on, the attention devoted to one or two chosen specialties should be gradually increased, and the time devoted to the other engineering subjects tapered down.

After all, our first necessities of life have to be taken care of systematically, if our body politic is to continue

Editor's Note—*An address delivered before the Trustees, the Faculty, and invited guests of the Polytechnic Institute of Brooklyn, at the University Club in New York City, on June 16, 1937, on the occasion of granting him an honorary degree of Doctor of Science.*

to exist. Europe has recently shown us two patterns of so doing, both based upon the principle of completely subjugating the individual to the state. We in this country have large groups of population drifting to communism or fascism, even though by far the largest portion of our population still believes in capitalism and democracy, and stands ready to defend them. Our future thus has at least three possibilities. The fourth possibility is a new form of society, with orderly planned industries and reasonably assured livelihood to all those willing to work, and yet preserving the best features of individual freedom and initiative. Demagogs and dictators will not bring about this form of society; closing our eyes upon the imperfections and inadequacy of the present system of government and of industrial control will only hasten the coming of some sort of "short-cut rule." Social engineers alone can convert our present society into a properly subdivided and inwardly correlated politico-economic unit wherein each of us could move in his proper sphere without dominating others or being dominated by them. My appeal is for such social engineers.

Cornell Host To Regional Foundry Conference

RAYMOND F. HOWES '24 B.A.

The first Regional Foundry Conference ever held in New York State, which met on the Cornell Campus on November 26 and 27 under the joint auspices of the College of Engineering and the Buffalo Chapter of the American Foundrymen's Association, drew more than 200 representatives of the industry from six states. They listened to a number of papers on various phases of foundry practice, discussed their problems informally, and welcomed an invitation to closer cooperation with the College of Engineering in the future. It is highly probable that the Regional Foundrymen's Conference will become an annual event at Cornell.

Papers were read by carefully selected experts from various parts of the country, including L. B. Knight, Jr., Vice President of the National Engineering Company, Chicago; N. J. Dunbeck of Eastern Clay Products, Inc., Eifort, Ohio; R. G. McElwee of the Vanadium Corporation of America, Detroit; V. T. Malcolm, metallurgist with the Chapman Valve Company, Indian Orchard, Mass.; W .J. Corbett, Works Manager, the Atlas Steel Casting Company, Buffalo; H. W. Gillett, Technical Adviser, Battelle Memorial Institute, Columbus, Ohio; and Donald J. Reese, Foundry Engineer, Research Division, the International Nickel Company, New York. Because of the death of J. B. Deisher, Plant Manager of the Columbia Malleable Castings Corporation, Columbia, Pa., a few days before the conference, his paper was read by a substitute.

The delegates were welcomed by Dean S. C. Hollister and addressed at luncheon and dinner meetings by President Edmund Ezra Day, Dean Emeritus Dexter S. Kimball, D. M. Avey, Secretary-Treasurer of the A. F. A., H. B. Hanley of the American Laundry Machine Company, Cameron Beck, Director of the New York Stock Exchange Institute, and R. E. Kennedy, Technical Secretary of the A. F. A. The officials of the Foundrymen's Association spoke for a national organization representing 3,000 industrial concerns, with a usual attendance of 7,000 members at national conventions. The industry itself employs about 300,000 men and does a billion-dollar business annually.

Deisher's paper on malleable iron castings indicated the rapid changes taking place in this branch of industry. New methods of heat treatment have shortened the time from ten days to thirty, and in some places 15, hours, and have at the same time produced a stronger and more ductile product. More silicon is used; pouring temperatures are higher; and heat is applied more scientifically.

Knight spoke on the practical use of sands for making castings for steel, grey iron, and non-ferrous metals, outlining methods of mixing and blending sands for various uses and suggesting methods of treatment to improve sand quality. At the same session Dunbeck discussed the composition of facing mixtures—those lining the center of the mold—to improve the surface of castings. Chairman of this session was Professor H. Reis of Cornell, one of the pioneers in the scientific study of foundry sands, and now Technical Director of all research in this field carried on by the A. F. A. He has been a member of the A. F. A. committee charged with developing methods of testing the properties of sands since its organization in 1921, and has devised tests and types of apparatus now used throughout the world. Last year the A. F. A. awarded him its highest honor, the Joseph S. Seaman Gold Medal, for his contribution to the industry. Apparatus for testing the permeability of sands, designed under the direction of his committee, was produced for several

years by Professor A. E. Wells in the Cornell Mechanical Engineering laboratory. Professor Wells also served as chairman of a sectional meeting at the Regional Conference.

McElwee explained how alloy cast irons are used to get unusually high strength or other special properties, such as corrosion resistance, beyond those possible with ordinary castings. He explained proper casting techniques and the value as alloying agents of nickel, chromium, molybdenum, vanadium, and titanium. Corbett's paper, at a later session on steel castings, consisted of detailed examples of good and bad foundry practice as applied to design of castings, facing sands, backing sands, design of molds, venting, gating, shrinkage, feeding heads, pouring, and other phases of the process. Malcolm traced the historical development of modern technical methods.

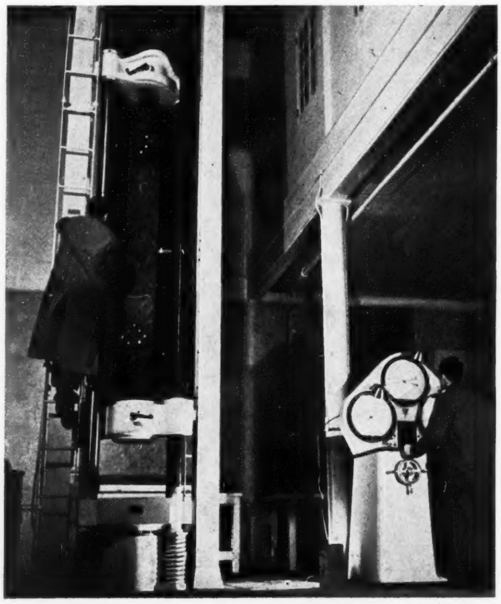
The role of silicon both in ferrous and non-ferrous castings was discussed by Gillett. He stressed the importance of silicon as a plentiful and relatively cheap alloying agent. For aluminum silicon gives fluidity, good casting qualities, ductility at high temperatures, and a low coefficient of expansion. Silicon added to copper makes a good welding rod for fastening copper to iron, and also produces a product with high resistance to corrosion. A welding rod containing silicon has made possible the welding of aluminum parts and has been responsible for the development of aluminum office furniture.

Reese gave a comprehensive and detailed paper on the cupola melting process, showing the interrelations between cupola charge melting and pouring temperatures, and discussed various phases of design, as well as accessories, equipment, materials, supervision, and the quality of the product. He illustrated his talk with charts and tables and cited numerous actual examples. In this respect he typified all the speakers at the conference. Many of those attending spoke of the fact that all of the papers were practical and concrete, rather than abstrusely scientific. As a result, there was spirited discussion from the floor at every session, and a brisk interchange of ideas throughout the meeting. Other members of the A. F. A. who took part in the program as chairmen of sessions included R. K. Glass of the Republic Steel Corporation, Buffalo; H. H. Judson, Foundry Supt., Gould Pumps, Inc., Seneca Falls, N. Y.; T. H. Burke of the Otis Elevator Co., Buffalo, and Chairman of the Buffalo Chapter of the A. F. A.; and A. Lockwood of the Lumen Bearing Co., Buffalo.

The conference definitely foreshadowed an era of closer co-operation between the College of Engineering and the Foundry industry. Men of prominence in the association expressed not only their satisfaction at the way the conference was handled, but also their approval of the general program suggested by President Edmund Ezra Day.

Dr. Day's program, explained by him at the banquet Friday evening, embraced three chief topics: the function of research, the education of engineers at the university level, and the training and employment of young men between the ages of 16 and 21 who lack either the ability or the resources for a college education. The first two, he said, are problems that affect industry and the university; the third must be solved by industry and the public schools.

Agreement with Dr. Day was expressed at length by B. D. Fuller of the Whitehead Brothers Co., Cleveland, and by McElwee. Fuller compared the equipment available fifty-six years ago, when he first became a foundry apprentice, with that in general use today. Ladles containing 350 lb. of molten metal had to be carried by hand, and the products, when cast, had to be moved by hand cranes. "Advancement since that time, due in large part to scientific research, is hardly conceivable," he declared, and supported Dr. Day's statement that "industry should more and more bring fundamental research problems to the university, and the university should make stronger efforts to make the results of research immediately available to industry for practical application." This process can be accelerated, Fuller continued, by conferences such as this one at Cornell. "For instance, take Reese's paper on 'The Cupola Melting Process' Saturday morning. I've been working with cupola furnaces for forty years, but I learned things that seem revolutionary and are



The 300,000 pound Southwalk Testing Machine in the materials testing laboratory in Lincoln Hall.

yet, I believe, practical. Many of us will change our procedures when we get home."

Many others echoed this statement with references to the College of Engineering laboratory demonstrations, including materials testing, microscopic examination of cast metals, photo-elastic investigation of tension and strain, and high temperature testing of foundry sands in the new apparatus which shows the behavior of various types of sand at temperatures as high as 3,000 degrees Fahrenheit.

McElwee was especially eloquent on Dr. Day's second point, that engineering education at the university level should not be too narrowly technical. "The most valuable asset of a college graduate," he said, "is not the actual facts he acquires but the ability to use research for practical purposes and the social training that enables him to make a good impression when he meets people. The foundry industry has a dearth of men capable of making contacts with people, not of men for the machine shops.

"Young engineers need most of all to cultivate open-mindedness. That is the essential characteristic of the first-class college-trained man, and there will always be plenty of opportunities in industry for him. He should also have some cultural background. The university should strive to make a man, instead of filling an index with information. When I pick a man I want to know about his outlook on life as well as his technical qualifications."

At this point Fuller broke in to state his thorough agreement with McElwee, and to add that the first-class college graduate is willing to accept practical training on the job, realizing the necessity of starting at the bottom and climbing.

Fuller has also had considerable experience with the sort of schools Dr. Day recommended for youths between 16 and 21 who can not go to college, and heartily endorses them. Excellent foundry schools, he said, are in operation in Cleveland and Milwaukee, run by the board of education. There should be more such schools, he declared, where students can divide their time between studying and working on an actual job. "Our company has employed many graduates of such training schools," he said, "and for certain types of work we find them highly satisfactory. I believe industry is willing to co-operate in any effort to increase the number of these schools and hence to help the problem of giving employment to youth."

Co-operation between the College of Engineering and the Buffalo Chapter of the A. F. A. on the conference was praised by Reese, a former past president of the Chicago Chapter who has attended all the preceding 15 regional meetings of the organization. "The purpose of these conferences," he explained, "is to aid in correlating plant operating problems with academic studies. The university's physical equipment and staff play essential parts in this project in adult education.

Mr. H. L. York working at the new apparatus for testing foundry sands at high temperatures.

"There were more faculty members of the entertaining university taking an active part in the meeting at Cornell than at any previous meeting," he said, "and the presence of President Day, Dean Emeritus Dexter S. Kimball, and Dean S. C. Hollister made it a memorable occasion. Special credit is due to Professor A. C. Davis and the other members of his committee."

Assisting Professor Davis were Professors W. C. Andrae and J. R. Moynihan in charge of the registration and hotel accommodations of visiting delegates. Professor C. W. Mason, assisted by G. E. Pellissier and E. V. Dorr, had charge of demonstrations showing the crystalline structures of cast metals, Professor F. G. Switzer and L. F. Welanetz of photo-elastic demonstrations of materials in the Mechanical Laboratory, H. L. York of operating his newly developed methods for testing foundry sands, and Prof. J. O. Jeffry, H. V. Hawkins, B. J. Conta, and W. P. Bebbington of the demonstration of testing of materials in tension, compression and torsion loading.

Entertainment features at the banquet were in charge of V. L. Whitehead of Buffalo, assisted by K. B. Sadler in charge of local arrangements. The Rosser Trio and the Savage Club Quartet provided music during and after the dinner.

The TVA
Unified Regional Development

Aaron H. Sullivan '38 EE

In 1824, John Calhoun, then Secretary of War, in a communication to the President of the United States James Monroe, recommended the improvement and the development of the Tennessee River. One hundred years later, in 1934, the Tennessee Valley had been organized and was in the midst of preparations for the first unified development of an entire area in this country. For the first time an attempt was to be made to coordinate and direct the forces of the country, state, county and municipality for the proper development of an entire region. During the previous century, spasmodic efforts had been directed towards cooperation between private industry and the public interest in the Tennessee Valley area. That the attempts had been for the most part unsuccessful was due not only to the lack of coordination between individuals and the rest of the area's population, but also to a lack of knowledge of the harmful effects of an absence of coordinated effort in developing a region such as the Tennessee Valley.

The Tennessee Valley

The Tennessee Valley area has a population of approximately two and a half million people, about half of whom are farm dwellers. Drained by the Tennessee River and tributaries, the Tennessee Valley area includes about 40,600 square miles. The headwaters of the river are in eastern Tennessee, western Virginia and North Carolina, and in northern Georgia. The main river begins just above Knoxville and flows in a southwesterly direction through Tennessee, crosses northern Alabama and then flows through western Tennessee and western Kentucky to empty into the Ohio River at Paducah.

The area drained by the Tennessee River is about four-fifths the size of England and includes a variety of natural resources ranging from forests, pasture lands, orchards, and small farms to large plantations and supplies of coal, iron, copper, aluminum and other minerals contained in the states of Tennessee, Mississippi, Alabama, Georgia, North and South Carolina, Kentucky, Virginia and West Virginia.

Prior to the advent of the TVA, the valley was the focal point of a discussion by both the people of the Valley and national leaders concerning adequate planning for the region. It was obviously impossible for a single private organization or any combination of private organizations to attempt a program for the long-time development of the region. It was also obvious that such a long-time development was needed. Resources of the Tennessee Valley were of such a nature that they were not only inter-state in scope but even embraced the welfare of regions outside of those directly connected with the Tennessee River. States as far north as Illinois and as far south as Louisiana may be directly effected by the vagaries of the Tennessee River and price and production of products in the Tennessee Valley area may effect or be effected by agricultural and industrial conditions in other areas.

TVA—Coordinating Agency

The TVA as amended in 1935 shows contemplation of: (1) integrated control of the Tennessee River and its tributaries and (2) the use of this integrated control to accomplish a number of purposes. Provision is thus made for the Tennessee Valley Authority to act as a coordinating and unifying agency to control developments in the valley area. Recognizing that to obtain the best results, a plan for the development of the Tennessee Valley must be all-inclusive, the TVA Act as amended in 1935 names several objectives: navigation; flood control; agricultural and industrial development; national defense; surveys for proper State and Federal legislation for complete development of the area; and the transmission and sale of such power as may be generated incidental to the above objectives. Thus cooperation is provided for between the Federal government and the local state, county and municipal governments and private industries.

River Control

In attempting the program for river control, it is necessary to consider the factors of navigation; flood control through physical storage and prevention of surface run-off; prevention of pollution and siltage; and the utilization of such energy as is available due to elevation head. All of these factors are inter-related not only within their own group but with other developments for valley improvements and national defense.

Two plans were presented for obtaining the necessary minimum navigation depth throughout the river

(a nine-foot channel from the mouth of the Ohio to Knoxville). Plan one contemplated the construction of 32 low-lift navigation dams which would provide a narrow channel of the necessary depth. This type of dam, however, would have no value for flood control purposes, would not prevent great fluctuations of water level at river terminals and could not be adapted to the generation of electric energy.

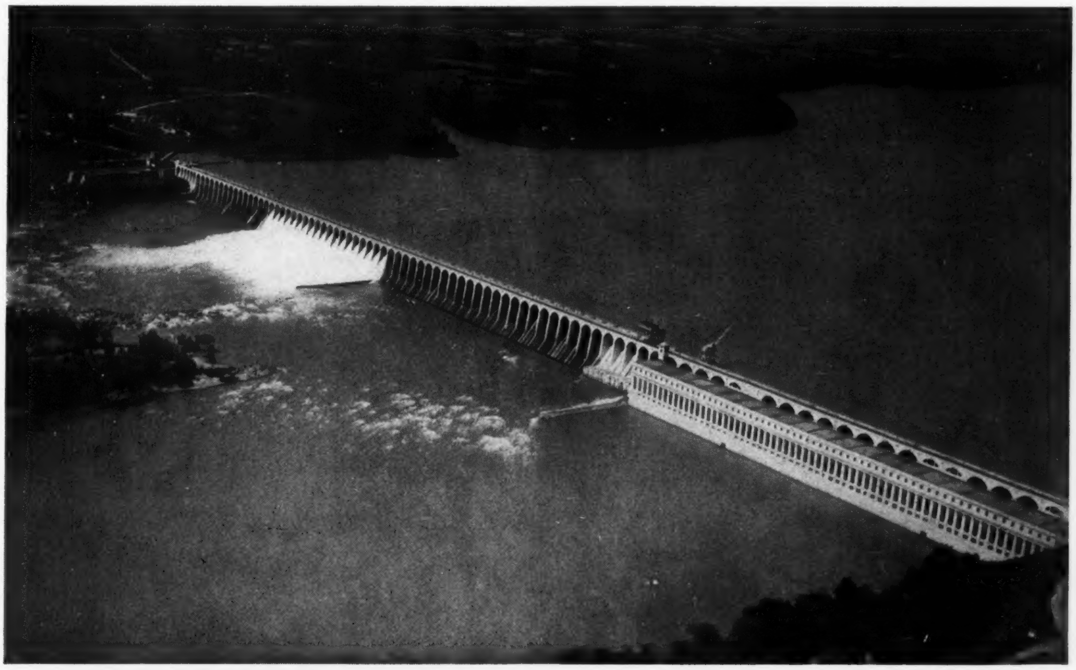
The other plan called for the placement of 10 high dams at "selected sites in the main stream." Since three high dams were already in existence (Government Dam No. 1 below Muscle Shoals, Wilson Dam at Muscle Shoals and the privately owned Hales Bar Dam near Chattanooga), the construction of only 7 high dams was necessary. In addition to their navigation features, these dams would provide effective flood control, would allow adequate land-planning, and would permit of the generation of electric energy from water power. The 7 dam development is, by its very nature, more adaptable to future river developments. Foundation conditions, with the exception of those at Chickamauga Dam, are excellent for these few dams. One third fewer locking operations will be required than the low-dam system, serious water level fluctuations will be eliminated and river traffic will be expedited by a wider channel. An added advantage is found in a greater depth of water in the tributaries, resulting in an additional 100 miles of navigable channel.

Flood control by the use of high dams is a function which can only be exercised by the Federal government. Private enterprise is interested only in water control for the generation of power, and it is evident from the length and size of the Tennessee River, that the Federal government is in a position to accomplish an integrated control of the entire watershed in the Valley. The location and design of dams has been dictated primarily by navigation and flood control necessities. It is the job of the TVA to unify the dam-building projects with a number of other projects designed to reduce flood danger to a minimum.

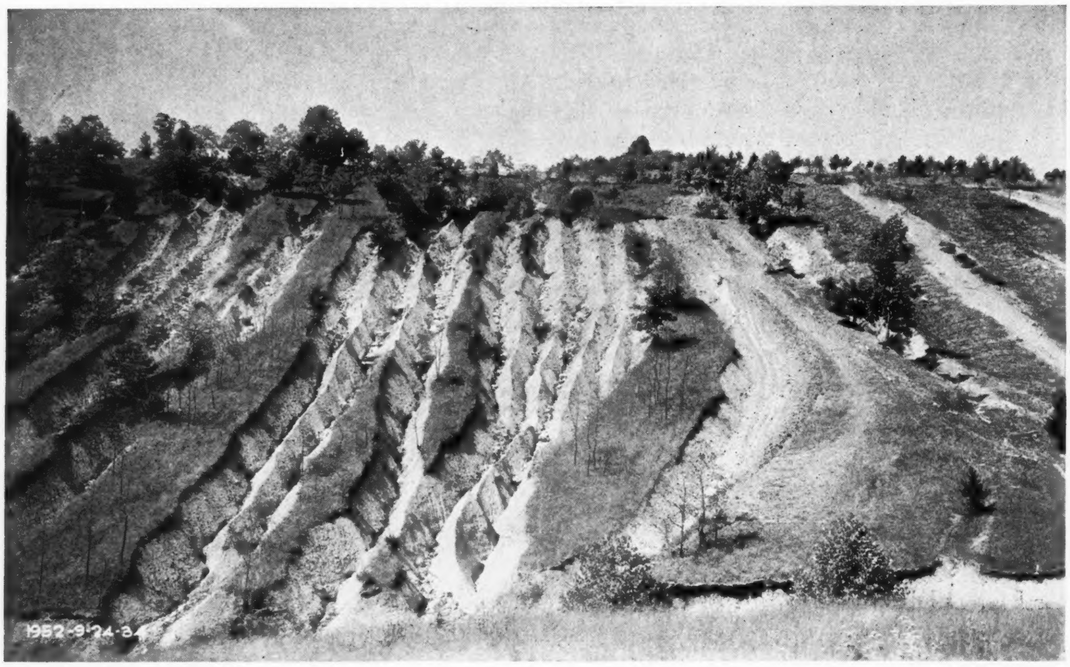
The greatest flood in the Valley occurred in 1867 with a maximum discharge at Chattanooga of 430,000 cubic feet per second. Consideration of other data both from the Valley and from other sources leads to anticipation of floods with a discharge 50 per cent greater than that of 1867.

Another flood condition to be considered is the contribution of the Tennessee system to Ohio River and Mississippi River floods. In January 1913, the Tennessee River contributed over 240,000 cubic feet per second or 18 per cent of the Mississippi peak flow below the mouth of the Ohio, and in March, 1927, the Tennessee River discharged 297,000 cubic feet per second into the Mississippi or approximately 20 per cent of the total Mississippi crest. Thus it can be seen that the control of this run-off will give substantial relief to the flood situation in the lower Mississippi valley.

It is planned to accomplish flood control by means



Wilson Dam, Muscle Shoals, Alabama. Generating capacity, 445,000 kilowatts.



Eroded hillside in Tennessee Valley. This and similar disasters are remedied by erosion control work.

of storage reservoirs in the tributaries in the mountainous upper basin—the Clinch, the French Broad, the Little Tennessee and the Hiwasee Rivers. Storage will also be provided in the main river reservoirs. Characteristics of the Tennessee River basin allow flood predictions to be made several days in advance of the flood wave at Chattanooga and over a week in advance of the flood wave in the lower sections of the river. The lower reservoirs are sufficiently near the Mississippi River to permit operation with respect to almost immediate needs at Cairo, Illinois and below.

Valley Development

Immediately connected with the flood and navigation control is the program for the development of the land, and the agricultural and industrial resources of the area. The program of erosion control and land management attempts to combine most effective use of the land for agriculture and industry with effective water control. A wide-spread effort to properly manage the land would not only increase available land for agricultural purposes but would also provide a substantial flood-control effect. If half of the Tennessee River drainage area were improved so as to absorb four more inches of rainfall per year than it now absorbs, a storage as great as that of Norris reservoir would be available. Proper prevention of erosion by means of terracing, and raising of grass crops and forest cover will materially benefit not only those engaged in agricultural activities but everyone living within the area of the Tennessee Valley.

The seriousness of the soil fertility situation in the South is not generally recognized either in the South or in other parts of the nation. There has, however, been a steady depletion of soil resources and natural plant food in the Southern areas since colonial days due to the agricultural system used in the South. It was the seriousness of this situation that caused Congress to include in the TVA Act, a fertilization program. It was not only necessary to discover new sources of plant food, but it was also necessary to find a successful means of applying these plant foods in keeping with the economic condition of the small Southern farmer. Mining operations in Florida and Tennessee produce about 3,000,000 tons of phosphate rock per year of which about 100,000 tons is exported. Yet it is estimated that the United States alone could consume ten times the phosphate it now uses. Investigation into the possibilities of fertilizer production of soil planning education is being carried on throughout the Valley.

Power Development

Under section 9a of the TVA Act, it is provided

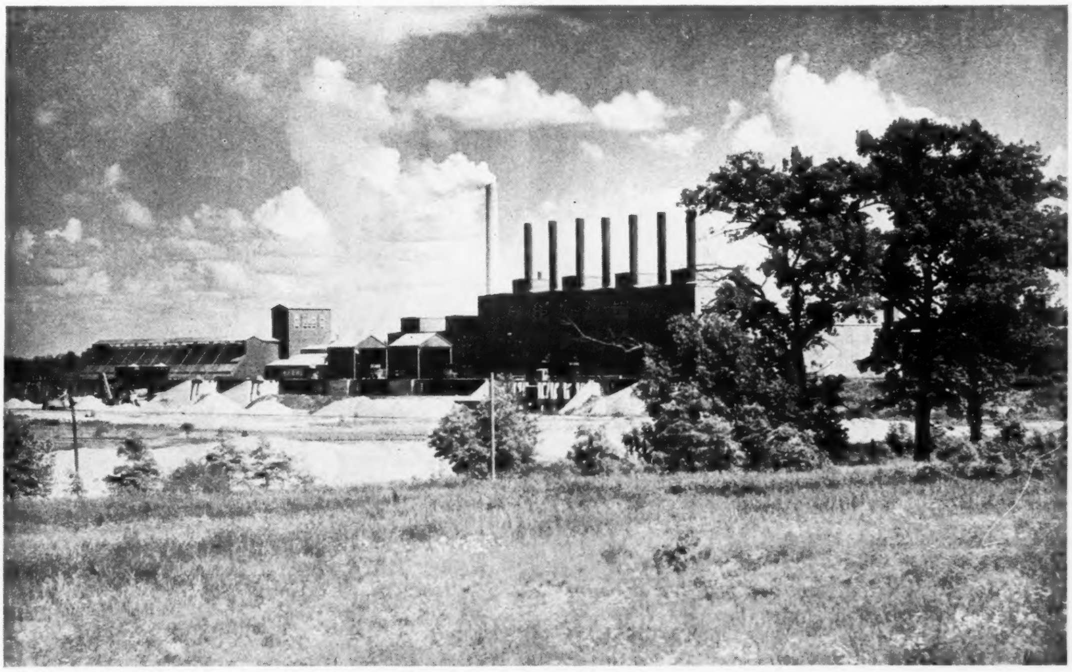
"that the board (of Directors) is further authorized whenever opportunity is afforded, to provide and operate facilities for the generation of electric energy in order to avoid the waste of water power, to transmit and market such power as in this act provided and thereby, so far as may be practicable, to assist in liquidating the cost or aid in maintenance of the properties of the Authority."

As stated by Mr. Chief Justice Hughes in the majority opinion of the Ashwander-TVA Case, "the power of falling water was an inevitable incident to the construction of the dam."

Thus, as part of its program, the TVA is selling the power resulting from development of the river system. The dams are so constructed as to have as high an all-around efficiency as possible which means that their purpose must be threefold: to aid in flood control, to assist navigation and to make possible the conversion of the mechanical energy of the water to electrical energy. The sale of this electrical energy is intended to partially or entirely cover the cost of work done for navigation and flood control. Generating facilities are provided only at those points where they are justified by good engineering practice and where there is reasonable assumption of a market for power within transmission distance.

Fortunately, efficient operation of a river system for flood control and navigation is consistent with efficient operation of the system for power generation. However, it must be pointed out that such a condition holds true only when the *entire* system is considered. It follows from the fact that the system has both tributary and main stream flow. The hydro-electric power most in demand is that which is *prime* power—power which is *continuously available* even during exceptionally dry seasons. A storage dam on a tributary has little, if any, power available during flood periods. Its primary purpose is the prevention of floods and it is thus necessary that water flow be kept to a minimum in the tributary during a flood period. At this same time the flow in the main stream is a maximum and maximum power is therefore available in the main stream power plants. Conversely, during periods of drouth, water is released from the tributary storage to maintain the constant level of the main stream. A smaller amount of power is available in the main stream but the tributaries are supplying their maximum amount of power. Thus through an integrated system the three primary objectives are accomplished—flood conditions are controlled, navigation is maintained, and a high prime power level is available. The table below shows the effects of water regulation in increasing prime power capacity of main river plants.

(*Continued on page eighty-two*)



—*Cuts Courtesy TVA*

Experimental Fertilizer Plant at Muscle Shoals, Alabama.

Undergraduate Soc

Tau Beta Pi

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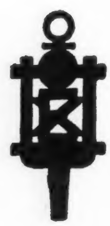

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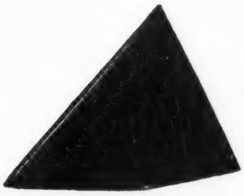
ties in Engineering



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Modern Water Law

Romeyn Y. Thatcher '09 CE
Professor of Civil Engineering

Most of us take water for granted and assume that we can always obtain an ample supply and that it will be of satisfactory quality. We do not appreciate its economic importance, nor the extent to which it is a vital necessity not only for drinking and household purposes but also in such fields as agriculture, mining, manufacturing, transportation, and power development. We are apt to think of it as a 'free good' somewhat like the air we breathe.

Economic Importance of Water

As a matter of fact in the early stages of civilization water *was* a free good, the common property of the public; and not until the development of private ownership of land in the early days of the Roman Empire was there any such thing as property rights in water, or any need for laws governing its use. With the growth of modern society under the economy of private enterprise water has become increasingly important, and in many sections of our own and other countries it is now decidedly a 'scarce good', calling for careful study and planning on the part of engineers, hydrologists, geologists, economists and lawmakers in order that the available supply may be developed, conserved and put to the most beneficial use for the welfare of all people. Water in the sea, in the larger lakes and in navigable rivers forms an exception to this rule, and is open to use by the public with few if any legal restrictions. We are here concerned with laws dealing with water in classifications other than these latter, and this discussion refers to both surface and underground bodies in various situations.

History of Water Law

Although the laws of surface streams, generally known as riparian laws, are derived from the English common law which in turn had its foundation in the civil law of the Romans, the laws of underground water are of much more recent origin, being less than a century old. Another comparatively recent development in water law, applying to both surface and underground flow, has been the doctrine of prior appropriation, which now governs in most of the so-called arid states west of the Mississippi River. In these states prior appropriation has superseded the older riparian law, and differs radically from it as will be explained below. The appropriative doctrine has also become of considerable interest to users of water in the eastern or humid states, because of the fact that there is an increasing advocacy, among engineers and other authorities, of its application to underground water along the eastern seaboard.

Various Classifications of Water

Before discussing legal doctrines some general comments may be made in regard to the use of water, and the several ways of defining and classifying it. For example its use for household purposes in rural areas and for stock watering is so small in comparison with the amounts utilized for municipal, industrial, irrigation and other commercial purposes that the former use is of little concern to lawmakers and administrators. Therefore this article refers almost entirely to the last mentioned larger uses.

Another consideration is the relative proportions of surface and subsurface water utilized. This of course varies greatly in different sections of the country. In California, which is by far the largest user of underground water among the states, much more than half of all water taken is from subterranean sources. In other states surface supplies predominate, although in practically all of them a considerable use is made of ground water,—in the West for both municipal and agricultural purposes and in the East for municipal supplies. Statistics covering the decade from 1919 to 1929 indicate that for irrigation alone throughout the whole country the use of underground water increased nearly 100%, while during the same period the use of surface water decreased 6%.

As a result of the greater interest in subsurface water and the investigations and studies that have been carried on during recent years, our knowledge of its location, extent and flow characteristics is more adequate and less speculative than in former years. We now find that commercial ground water occurs in the following five general physical situations:

1. In definite underground channels which have been formed by erosion or chemical action. There has been considerable confusion both within and outside the courts as to what constitutes a channel, and some western courts have extended this classification to include flow several miles in width through porous soil in bottom lands.

2. Percolation through basins, a typical example being the San Gabriel Basin in California where water from the surrounding hills during the four rainy

months creates a perennial subsurface flow toward the sea, the depth of water table varying from 50 feet to 400 feet below the surface.

3. Underflow supporting surface streams, illustrated by the valley of the South Platte River where both the river and its much wider underground flow move north near Denver, Colorado. Both river water and subsurface water are used to irrigate some 1,250,000 acres of land. Pumping from underground supplies at present represents a very small percentage of the total water used, but appears likely to increase in future years.

4. Artesian areas, where water, because of the topography of surrounding ground, is under such pressure that it will emerge from the surface without pumping, after a well has been driven.

5. Alluvium or glacial till saturated by deep percolation of surface water from rains, or possibly from irrigation. This is more common in the eastern states, a nearby example occurring on Long Island which is underlaid by a water table supplied by the percolation of about one-half of the 45 inch annual rainfall. The Borough of Brooklyn taps this water for a large part of its municipal supply.

Courts frequently have to distinguish between what is legally known as surface or standing water, and water courses or water flowing in a definite channel, since the general rule is that both the riparian and the appropriative doctrines apply only to flowing water. As regards water above the ground it is comparatively easy to make this distinction; but for underground water there are greater difficulties, partly because its boundaries are not readily ascertainable, and partly because its movement is often extremely slow. Consequently there has been a tendency on the part of the courts to treat all underground water as flowing and to apply to it the law of the particular jurisdiction.

In some states different laws apply depending upon whether the water is above or below the surface. As a matter of fact practically all underground flow is water on its way to the surface at some lower point. In other words it is the same water whether tapped by a well in its underground aquifer, or taken from a surface stream after it has emerged from the ground. This is apt to complicate the administration of water law when there arises a conflict of rights between users of a surface stream and users of the same water in a previous underground state.

It is evident that both surface and subterranean water must be taken into account and investigated in the formulation of policies, procedures and statutes dealing with the administration of available supplies in the best interest of all users. For example in many parts of California underground water has already been overexploited, causing a serious lowering of the underlying table to the detriment not only of some of the underground users but also of the users of surface streams nearer the coast. Another interesting question of legal rights may arise where the underground supply is near the sea coast, when the lowered water table results in an increase in salinity of wells or possibility of surface streams nearer the ocean. This claim was made by users of water along the north shore of Long Island in suits brought against the Borough of Brooklyn. It was cited as a strong argument against the Florida Ship Canal.

The Riparian or Correlative Doctrine of Water Law

According to this doctrine, derived from English common law, each landower along a stream is entitled to have the water flow in its natural channel unpolluted as to quality and undiminished in quantity, except as modified by the following two recognized uses by other owners adjoining the stream:

1. As regards the ordinary or natural use, such as for domestic purposes or watering stock, any riparian owner may take as much as he needs, even to the extent of the entire flow, as might happen during periods of low water.

2. For extraordinary or artificial uses, as for irrigation, mining, manufacturing or the like, each owner is entitled only to such an amount of water that his diversion will not interfere with a like use by all other owners on the same stream. That is to say his right is coequal and correlative; hence the riparian law is often spoken of as the correlative doctrine.

It will be noticed that the strict application of riparian water law gives little aid and comfort to non-riparian landowners, who may need the water just as badly as their more fortunate neighbors bordering the streams. This discrimination as to water rights is not so serious a matter in the humid states where normal rainfall enables farmers to get along fairly well without resort to irrigation. In the arid and semi-arid states of the West, however, there is a different situation, and non-riparian farmers would be greatly handicapped, if not entirely prevented from cultivating their lands, were it not for the fact that these states have abrogated the riparian doctrine and have adopted in its place the legal rule of appropriation. Although agriculture has been the chief beneficiary of this change in the law, other interests such as mining and manufacturing have also been afforded relief from intolerable conditions.

As for those states whose statutes and court decisions continue to follow the correlative doctrine, a non-riparian owner located in an arid region can obtain necessary water only by incurring what is apt to be a prohibitive expense. If he is fortunate he may obtain his water supply by the permission or consent of the various riparian owners affected, possibly having to pay for any damages resulting therefrom. Other-

wise he must either purchase the water, buy up riparian lands to whatever extent the statutes require, or buy riparian rights from the owners along the stream (the courts having in most cases sanctioned such a sale of rights.)

Before leaving the subject of riparian doctrine further mention should be made of underground water, as some states differentiate between surface and subsurface flows in their interpretation and administration of water law. Whereas the application of this law to surface water is substantially as above stated, we find that for subterranean water riparian law is applied in three different ways depending upon the jurisdiction:

1. Some states assume absolute ownership of the underground water by the owner of overlying land, with no obligation whatever to respect the rights of others. This is called the English rule, or the doctrine of unreasonable use.

2. Other states grant to the overlying owner absolute ownership of underground water to the extent of reasonable use on his own land, but with no right to export it to other lands if this would in any manner damage other users of the same flow. This is known as the American rule of reasonable use.

3. Under the so-called California doctrine a landowner's right to water below the surface is held to be coequal and correlative with that of every other landowner overlying the same basin or stream. This view is rather popular in the West. In fact even in some of the appropriative state the courts have applied it to the use of underground water, although such an interpretation is incompatible with their laws governing surface flow.

The Appropriative Doctrine of Water Law

The history of this legal principle dates back to the gold, silver and copper rush beginning in 1849, which marked the earliest settling of miners and other pioneers on what was at that time largely public domain. Prospectors staked out claims, and built flumes or ditches to carry from the nearest stream water needed in placer mining operations. As the country was settled during subsequent years there ensued a period of conflicting and bitter dispute regarding the use of water and its transportation across the lands of homesteaders, with considerable confusion as to the water law and its administration by the courts.

With the aid of a series of important Federal statutes enacted from 1866 to 1870 the situation was greatly clarified, the net result being that the western states divided themselves into two distinct groups with reference to water law. The first group elected to adhere to the older riparian law, which they deemed adequate and satisfactory in view of the fact that water was generally abundant enough and rainfall sufficient to meet their needs. Furthermore the courts in larger cities or in the older and more thickly populated sections, have always inclined to a more conservative interpretation of the law. They are less likely to break with tradition and to embark on new theories. It will be observed that the states first settled and containing larger centers of population are found in the so-called riparian rights group. Geographically these states form a ring that borders on the Pacific Ocean, the west branches of the Mississippi River and the north and south boundaries of the United States. They at first included California, Oregon, Washington, Montana, North and South Dakota, Nebraska, Kansas, Oklahoma and Texas.

The second group, which definitely adopted the appropriative water law, comprised the interior states of the more arid region, and included Nevada, Idaho, Wyoming, Colorado, New Mexico, Arizona and Utah. This original division has been pretty well maintained down to the present time, although there have been some slight modifications. In 1921 court decisions in Montana rejected riparian law and embraced the appropriation doctrine, indicating that this state has moved from the riparian to the appropriation group. The appropriative view of water law now exists also in the more arid portions of North and South Dakota, Nebraska, Kansas, Oklahoma and Texas, although this is in direct conflict with the prevailing riparian theory of law in these states. In Oregon and Washington riparian rights have been partially abrogated, and in California an appropriative procedure has been superimposed on the basic riparian doctrine. In these latter three states the courts now interpret the law so as to permit reasonable appropriation. The foregoing summary indicates the strong hold that prior appropriation has now obtained on a large section of the country west of the Mississippi River.

As regards underground water it may be said that in general prior appropriation law applies equally to surface and subsurface flow. It assumes an entire lack of ownership on the part of the landowner, but ownership by the State. The State permits appropriation, following statutory procedure and subject to prior rights of other users, whether surface or underground water is involved.

The reason for the overthrowing of the traditional riparian law and its being supplanted by the more modern legal theory of prior appropriation lies in the fact that all law is founded and rooted in the customs, usages and conditions of the people governed by the law. And it soon became evident to the majority of the citizens of the western states that their customs, circumstances and general situation were so far different from those that existed in England and in other old civilizations that riparian rights doctrine no longer would serve their interests; a new and more suitable rule of law was indicated.

It is probably correct to say that this new appropriative doctrine was borrowed from Mexican law, as the latter country followed the rules of Spanish law which does not seem to have recognized such an institution as riparian rights to water. The Mexican government has always reserved the power to grant rights of appropriation to prospective users of water. This would appear to be merely an application of the ancient Spanish law that to the crown, or to the state, belong all things of value in or under the ground, including precious metals, ores, oil and water. The government, rather than the owner of overlying land, controls these natural resources, and in theory will conserve and administer them to the best advantage of the people. It is also interesting to remember that the royal prerogative to seize upon certain natural resources was once a part of English law. It applied to precious metals found in the ground, to large fish in the sea, and to tall straight trees which the king might take for shipbuilding. There is considerable support for this theory as applied to the development of water resources in our own country, and the widespread adoption of appropriative law in the West is one example of it. Appropriative doctrine holds that water is so important to the welfare of the people that it properly becomes public property which the State owns in trust for all of them; it is not the private property of the riparian owner. In fact it has recently been suggested by some authorities in the East that appropriative law might well be applied to underground bodies of water wherever found. Water Commissioners in New York and New Jersey have already made moves in this direction.

By the usual procedure in exercising prior appropriation the prospective user must take certain statutory steps such as posting a notice at the point of diversion, filing a copy of this notice with a designated authority, and constructing flumes, canals or other diversion structures, whereupon the State grants him a prior and exclusive right to as much as he needs. Priority of use follows the rule: "First in time, first in right." It is generally agreed that appropriative law lends itself to administrative control much better than does riparian law. States adopting this rule have set up by statute an elaborate system of control, procedure and adjudication of disputes. Streams are patrolled to see that each user gets the water to which he is entitled. It is also claimed that the exclusive appropriative doctrine is more consistent with the law of real property than is the riparian or correlative doctrine of water law.

Criticism of the Two Doctrines

As interpreted by the courts neither doctrine has been entirely satisfactory at all times and in all situations. Under prior appropriation during periods of low water junior appropriators may have none left after prior parties have taken all the water they need. Partial relief has been obtained on some streams by virtue of reservoirs constructed largely with Federal funds. Correlative law on the other hand permits all users to share alike, which may or may not result advantageously, depending upon how much water is available to each and how essential it is to his needs. Correlative law, as before mentioned, discriminates sharply between the favored riparian owners and the non-riparian individuals or interests who may be completely barred from water supplies. This inequity has been remedied in the arid regions of some riparian states by permitting a limited reasonable use by non-riparian parties.

Administration of Water and Water Law

As regards the administration of existing water resources together with the enforcement of governing statutes, it will be found that control over surface waters is being exercised in a variety of forms, but that underground supplies are as yet subject to a much slighter degree of regulation. The latter classification presents a more difficult and complicated problem, whose satisfactory solution requires the gathering and analysing of a large volume of data.

If there happens to be a conflict of interest involving a large stream whose water is used by the citizens of two or more states, the United States Supreme Court has jurisdiction and attempts to make an equitable allocation of the supply. It has been the policy of both Federal and State courts not to very greatly disturb existing uses and rights, but to make every effort wisely to control, coordinate and regulate additional future uses of available water. Toward this end reservoirs, dams and other regulating devices will continue to be constructed.

At the same time the whole situation is being investigated and studied by public commissions and other interested parties throughout the country, looking toward an intelligent, farsighted and economically sound solution of this nationwide problem. The work already done by the California Division of Water Resources and by the Water Resources Division of the Federal Resources Commission has been outstanding; but our knowledge is far from complete in many parts of the country. It has been urged that such national organizations as the American Society of Civil Engineers, American Water Works Association, Society of Economic Geologists, and the Section of Hydrology of the American Geophysical Union interest themselves in the various phases of the subject, so that we may avail ourselves of the experience, training and talents of the large group of professional members there represented.

Where existing water law is found to be unworkable and unsatisfactory legal minds are working toward further modification of statutes so as to insure a more equitable, flexible and uniform distribution of this rather unstable commodity—water.

COLLEGE NOTES

CHI EPSILON INITIATION

On Tuesday, November 23, Chi Epsilon held its formal initiation and banquet in the Dutch Kitchen. William H. Scott spoke for the initiates in response to the welcoming message from Richard S. Goodwin, president of the Cornell Chapter. The guest speaker was Professor Gilmore D. Clarke, well known off and on the campus for his work in regional planning and his connection with such major engineering projects as the New York World's Fair and the New York City West Side Highway. The speaker stressed the need for greater cooperation among professional groups, especially as between architects and engineers.

The following men were initiated: Ivan Lathrop Bogert, Carl Harger, Gene Louis Hintgen, William Hamilton Scott, Paul Arthur Schaaf and Joseph Middleton Steele.

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C. E. SMOKER

The A.S.C.E., Chi Epsilon, Rod and Bob, and Pyramid jointly sponsored a Smoker for the students of the School of Civil Engineering on Wednesday evening, December 1. Activities were under the direction of Dean S. C. Hollister as master of ceremonies and included talks by Dean Emeritus Dexter S. Kimball and Dr. George M. Sutton. Dean Kimball spoke on the element of luck as it affects one's life, stressing the need for being prepared to capitalize on opportunities as they arise. Dr. Sutton gave an interesting account of several of his pursuits of evasive birds, with an illustrated lecture on the rarer birds and a detailed narrative of his exploits in finding the first eggs of the exceptionally rare American bird, the Harris Sparrow. Dr. Sutton, who is curator of birds here at the University, brought along some specimens which were carefully examined as the group enjoyed the refreshments of cider and doughnuts.

PROFESSOR KARAPETOFF WRITES POEMS

Under the title RYTHMICAL TALES OF STORMY YEARS, Professor Karapetoff of the Electrical Engineering School has had a collection of his poems published recently in New York. Available at the Co-op, the poems are the result of the desire of the author to express his various emotions in poetry. Written over a period of a number of years, the poems are proof that an engineer need not deal with only material matters but may also develop a more versatile interest in adjacent fields of humanity and philosophy. He may have feelings and emotions even as ordinary mortals, and the fact that he deals with practical knowledge and facts should be no deterrent for creative thinking along other lines. Prof. Karapetoff has written of widely differing subjects in a manner that shows a fine, sensitive realization of a philosophy of life—a philosophy that is the result of full, rich years of living and contact with men and women of all types.

> "My star has destined me
> For deeds of justice and of mercy
> Inspired by glowing love for man.
> Yet in my younger days, this love
> Was dimmed by baser fires . . . ."

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LINCOLN DEMAND METER

Under the direction of Professor Lincoln as president, announcement has been made of the creation of an industry in Ithaca for the manufacture of the newly developed Lincoln Demand Meter. The new meter is the result of experimental work done during the past few years by Professor Lincoln and associates with a thermal method of measuring kilowatt demand. The result of the developmental work has been a perfected type of demand meter which gives positive and accur-

ate measurement of kilowatt demand. One hundred of the meters have been in the hands of public utilities for testing with extremely favorable reports.

Manufacture of the meters will begin in a few months in a factory to be built on South Hill by Ithaca Enterprises. Associated with Professor Lincoln will be H. L. Goodman who recently resigned from the College of Engineering to take a position as vice-president in charge of production, Dana Green, and R. R. Sprole who graduated from the College of Engineering in 1935 and will be in charge of engineering sales.

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AIEE HOLDS MEETING

At the meeting held Friday, December 3, in Franklin Hall, Walter R. Jones discussed the History and Development of Radio Tube Types. A graduate of the E. E. School in 1925, Mr. Jones is Commercial Engineer for the Hygrade-Sylvania Corporation at Emporium. He has been intimately connected with the development of multi-grid tube types since the days of the first screen-grid tube. In his talk before the Ithaca Section of the Institute, he traced the development of the vacuum tube from the diode rectifier to the present tube containing a multiplicity of grids. He showed how the development of present day tube types has been the result of demands made by set manufacturers upon tube designers to turn out tubes capable of increasingly better performance. An explanation of the how and why of the development of such tubes as the screen-grid, the pentode, the pentagrid converter and the recent beam-power tube was part of Mr. Jones' discussion. The meeting ended with an informal question and answer period.

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PYRAMID-ROD AND BOB TOUCH FOOTBALL

The annual football game between Pyramid and Rod and Bob was played on snow-covered Upper Alumni Field on Saturday, November twentieth. The snow didn't interfere with the aerial circus put on by Rod and Bob or the wide end sweeps staged by Pyramid. Both teams were strong on defense and the only score of the game was made when Rod and Bob's kick was blocked and Jack Gaul of Pyramid fell on it for a touchdown. Freddie Livingstone was referee, umpire, linesman, field judge, and official ball-wiper-offer. As members of the Honor Committee were present, both teams used the Honor System. The teams of Destiny, composed of eight men each, broke training with a beer party at the Pi Kappa Phi house. Final score: Pyramid 6; Rod and Bob 0.

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ENGINEERS' BALL

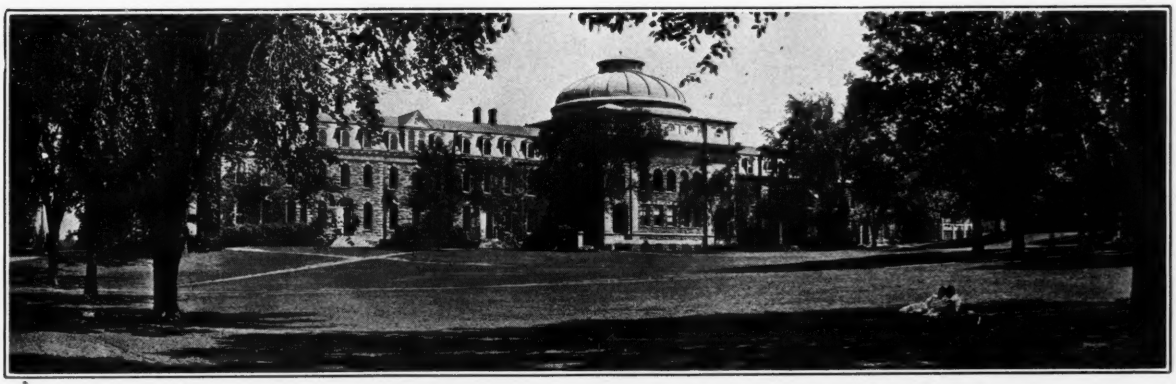
This year's annual Engineers' Ball was held in the Drill Hall on Friday night, December third, amidst the varied surroundings of steel rafters, soft colored lights, world war cannon, and vivid red banners. Central theme for the audible portion of the program was the flaming music of Andy Kirk and his rythmic, if none too fleecy, clouds of joy.

We enjoyed the privilege of dancing to these scintillating rhythms, and in so doing garnered information on two or three amusing incidents, herewith presented.

There was the frosh we met in the Sage lounge. It seems there is a definite rule in his house against freshman dates, so three of these brilliant young men concocted the notion that if all three of them were to take one girl to the Ball, none of them in particular would have a date with her, and so none could be blamed (or physically reprimanded) for having a date. We wouldn't want to put any bad ideas into freshman heads, but it sounded like a clever scheme. We're wondering if it worked.

It might here be appropriate to say that the gentlemen in the check room didn't seem to need any slide rules—they were quite definite.

And finally there was the fellow who got his audio frequency vibrations crossed and attempted to oscillate on the third harmonic instead of the fourth. He wound up doing his double shag on the floor. Which about winds us up too.



Do You Know These Men?

DAVID FARRINGTON SANDERS '38 EE

Experimenting with radio and television is just a hobby with David Farrington Sanders '38 EE, for whom this intricate and complex field holds few mysteries. Back in high school in Evanston, Illinois, Dave successfully built and operated his first television receiver, regularly receiving news reports, dance orchestras, and sporting events. To go further back than that, his first radio was a crystal set made in an ice cream carton, with a paper clip slide and a bed spring antenna.

Dave's interests are not confined to technical things, however, for track is one of his keenest interests. His freshman year Sanders was Captain of the Freshman Track Team, being one of the ablest sprinters at Cornell at that time. Repeated injuries to his leg have kept Dave from actively participating in varsity track to any great extent, so he has devoted his attentions to other things. Last year he was a member of the Freshman Advisory Committee, Delta Club, and Treasurer of both the Spring Day Carnival and the Engineers' Ball. This year he was Chairman of the Engineers' Ball and is now active in planning a Spring Day for 1938. His honorary societies include Red Key, Sphinx Head, Eta Kappa Nu, and Tau Beta Pi.

Summers Dave spends as crew and general handy man on his family's schooner which he sails on Lake Michigan. After college he hopes to enter the field of engineering sales, although he has not definitely decided with which company he would like to eventually become associated.

GEORGE CURWEN BRAINARD, JR. '38 ME

The unique record of being President of more campus organizations than any other person seems to belong to George Curwen Brainard, Jr., '38, ME who is at the same time President of Tau Beta Pi, President of Atmos, and President of his fraternity Chi Phi. A good balance of academic and extra-curricular work has been George's aim since entering Cornell. He has been a member of the Freshman Cap Burning, Engineer's Ball, Spring Day, and Cornell Day Committees. A regular on the 150 pound football squad, George is also a member of the Flying Club, and Quill and Dagger.

George graduated from Culver Military Academy where he was Company Commander of the infantry unit. He was also a member of the varsity crew, track and football teams, and Treasurer of his class.

As hobbies Brainard prefers golf, tennis, and flying. With insufficient time for much flying, and an erratic tennis game, he concentrates his efforts mostly on golf at which he is a onetime junior champion of his home town.

Summers he spends learning the ins and outs of his father's metal furniture business. The summers which he has spent in the various design and production departments have served to convince him that he is not interested in the highly technical side of engineering. In preference to this, George plans, after graduation, to enter engineering sales work in some not too technical field.

ALUMNI NOTES

DEAR ALUMNI:

Do our alumni notes seem rather dull to you? Do they seem too short, and stereotyped? Does the form "'09 CE—John Jones has moved to Podunk Falls" seem rather worn to you? Would you like to know more about your classmates, what kind of work they are doing, what they are interested in, how large a family they have?

If you feel as we do, that our alumni column is lacking, you are the ones who can remedy the situation. We can only print what we know. Unless people write, our only source of information is the Alumni News and hearsay. Why not make it a practice of writing us at least once a year. Tell us what you are doing, everything about yourself, don't be bashful, your classmates will be interested. If you have been elected President of the local lodge, say so. If you have invented a new kind of can opener, tell us about it. If you have any criticisms of the magazine, voice them, we'll see what can be done. If you want to know anything about the campus, ask that also. If we had enough requests for information, we might start a column of answers to questions.

If every alumni reader would write us at least once a year, we would be able to have a real live alumni column, one that would really be interesting and not dead. You, the Alumni, can do this. If you want a new rejuvinated alumni column, lets have letters, not just a few, but letters from you all.

———o———

'91 ME—Warren H. Meeker is in the engineering department of Iowa State College, Ames, Iowa.

'05 ME—Winfred M. Baldwin is with the Rogers-Baldwin Hardware Company, Springfield, Mo.

'10 ME—Edwin S. Crosby was elected president of the Johns Manville International Corporation July 1. He is also general manager of the Asbestos Fiber Corporation, a division of the Johns Manville Sales Corporation, and of the automotive department of the Corporation.

'08 AB, '10 CE—Hurlbut S. Jacoby, professor and director of industrial engineering at Ohio State University was in charge of the second annual industrial conference of the Ohio State University Research Foundation, held on October 23.

'15 ME—Ira E. Cole is in the circuit research department of the Bell Telephone Laboratories in New York City and is working hard over the development of voice-operated devices.

'31 EE, '33 BS—William S. Spring is an electrical engineer in the outside plant bureau of the Consolidated Edison Company of New York City. He writes, "I have been very active in photography as an avocation for a number of years. I have had pictures exhibited abroad in India, England, France, Scotland and Belgium. Several of my pictures were shown in all the principal cities of Canada in a traveling salon this past year. My wife, Susan D. Koetsch '33, is equally adept in this field and some of her work will be shown this next year throughout Canada. I am going to teach a course in photography this year at the Boy's Club of America in New York City." Mr. and Mrs. Spring live at 85 St. Andrews Place, New York City.

'35 CE—Egon F. Brummerstedt has become a cost engineer in the petroleum refining division of the Foster Wheeler Corporation, after two years as an engineer in the process equipment division of the Babcock and Wilcox Company, Barberton, Ohio. His address is 304 West Seventy-second Street, New York City. He writes, "I am unmarried and hope to continue the status quo somewhat longer. (No femineity slur intended!) I took a motor trip to California this summer."

'35 CE—Haywood E. Dewey, Jr., married Opel E. Gibbs of Goodland, Kan., on September 3. Dewey is a junior engineer in the hydraulics studies laboratory of the U. S. Bureau of Reclamation, Denver. He is in charge of model design, construction and testing.

'35 ME; '05, '06 ME—Fred A. Giesecke is a student engineer with the Corn Products Refining Company, and lives at 800 Washington Street, Pekin, Ill. He writes, "I went to Scotland last July, to visit my father, Fred O. L. Fiesecke '05, for two weeks."

'35, '36 ME—Wendell K. Upham is a test engineer with the Ingersoll-Rand Company, Phillipsburg, N. J., where he lives at 577 Morris Street.

'36, '37 CE—Kenneth B. Earnhardt entered the employ of the American Water Works and Electric Company in August. After spending seven weeks at the New York City office, he was transferred to the Ramey Water Company, a subsidiary at Houtzdale, Pa. His address is 609 Hannah Street, Houtzdale.

'37 AE—Paul R. Scofield writes that he is a trainee in the Eastman Kodak Company. "I spent the first nine weeks studying photography from the ground up and at present I am working in the comptroller division of the Company."

President's Column

Fellow Engineer:

This letter will deal with the subject: "Writing an Article for Your Magazine, the Cornell Engineer".

The Cornell Engineer is edited, managed and published in Ithaca by a Publication Board composed of Seniors, and Junior and Sophomore Boards, composed of undergraduates, who, in general advance to the Publication Board in their Senior year, and an Advisory Board composed of School directors, faculty and alumni. The magazine contains technical articles written, in the main, by Cornell alumni, undergraduates and faculty members. It further contains editorials, news of the schools, notes on the alumni and items of like nature. The magazine is read mostly by people having an interest in Cornell, but as it is a member of an association of engineering college magazines, totaling twenty-three, it probably is read by a considerable number of others. Plans are on foot to further extend its circulation.

No doubt the undergraduate editors, in common with the editors of other magazines, are hard pressed at times to find suitable material. Their "field" of authors is confined to faculty members and undergraduates, with whom they can quickly make contact, and the 15,000 or so alumni who are scattered throughout the world. These latter are difficult to contact and to urge the writing of articles.

There are four advantages or gains, maybe more, in the writing of a well considered engineering article. The magazine fills its issues with good matter and the readers gain knowledge. The writer rehearses his subject, refreshes his memory, exercises his ability to express his thoughts and gets into printed form the miscellaneous notes he has filed away in odd corners. Finally, and not least, the writer gains the prestige or advertisement, if you will, that accrues to all authors of informative technical articles.

An engineer, no matter how well grounded and experienced he is, is not advancing in his profession as fast as he should if his employers, present and prospective, are not kept aware of his abilities. Printed articles are the vehicles to convey this information. For some reason, I am reminded of the mighty tree falling in the forest. It makes a noise only when someone is listening. Cornell engineers, according to my reading, are rather deficient in authoring articles in the technical press.

What sort of article one should write for the Cornell Engineer, is a difficult question. An undergraduate, or one recently out of College, should write of his job or the peculiar problem he has just helped solve, and should bear in mind that the mature graduate, far away from the campus, will read the article particularly to inform himself of the grade of teaching now given at Cornell. The junior engineer, with five or ten years of engineering practice, could well select a description of the design, construction or operation of a structure, or of a machine with which he has been connected, or he could tell of a test of measure capacity and efficiency of a piece of apparatus. The older engineer, with his young undergraduate readers in mind, could tell of his experience in his special field of engineering. The point should be made that readers are many times interested in another man's specialty, be it machine design or sanitary engineering, and the writer need not try to write only for those engineers in his field. He need not be afraid to tell his engineering story in a simple way.

This is a call for old and new hands at the art of writing to become authors of articles in the Cornell Engineer. Naturally, the editors should be consulted as to subject, timeliness and length of article before the writing is started. Of course, everyone understands no payment can be made for such articles. You can communicate with G. J. Kaye, Editor-in-Chief, Ithaca, or H. B. Reynolds, 600 West 59 Street, New York City, Chairman of the Publication Committee of the Cornell Society of Engineers.

G. J. Requardt, *President*
Cornell Society of Engineers

(Continued from page sixty-nine)

Project Dam	Minimum Weekly Flow Unregulated	Minimum Weekly Flow Regulated	Percentage Unregulated Flow	Average Head (Ft.)	Continuous Power (Kilowatts)
Coulter Shoals	1700	2,400	141	65.5	11,000
Watts Bar	2900	11,800	407	61.5	51,000
Chickamauga	3500	16,000	457	44.0	50,000
Guntersville	4100	16,300	398	39.5	45,000
Wheeler	4150	18,600	448	50.0	66,000
Wilson	4300	18,900	440	92.0	122,000
Pickwick Landing	4350	20,100	462	54.0	76,000
Gilbertsville	4400	25,400	577	45.5	81,000

The TVA has limited actual hydro-electric generating installations to needs of existing and prospective markets. From studies of power consumption in the past, a knowledge is gained of probable future consumption. Based on this study, generating apparatus has been installed or plans have been made for its installation at the following projects:

Project	Kilowatts
Coulter Shoals	54,000
Watts Bar	150,000
Chickamauga	160,000
Guntersville	82,000
Wheeler	256,000
Wilson	445,000
Pickwick Landing	204,000
Gilbertsville	256,000
Norris	100,000
Fowler Bend	80,000
Fontana	150,000

By planning construction and building projects for the system as a whole, it is possible to avoid needless expense in organizing men and planning each individual project. The projects succeed each other in an orderly manner so that continuous use can be made of men already skilled in that particular type of work. Excess peak demands for skilled labor are avoided and equipment used on one project may be shifted to another project without deterioration setting in.

As expressed by the Board of Directors of the Tennessee Valley Authority in a report to Congress in March, 1936, "In the development of our country, it very often has happened that a great project is undertaken with a single end in view, and without regard to the possibility of developing additional benefits or to the danger of resulting losses. Construction of highways, railways, or factories may destroy possibilities for navigation, flood control, or power. Navigation developments may destroy flood control and power possibilities, and limited power developments may destroy possibilities of greater and more economical power developments, as well as flood control possibilities. As the pioneer days of our national development pass, and greater economy in the use of resources becomes necessary, their unified development becomes continually more important. This is fully possible only with the help of some planning and coordinating agency."

Stress & Strain

Overheard in Junior Mech Lab:

Vreeland: "You shouldn't pound your head against the floor. Do you want to injure it?"

Tone: "Don't be silly. This floor is concrete."

* * *

'Twas midnight in the parlor,
'Twas darkness everywhere;
The silence was unbroken—
There was nobody there.

* * *

"Certainly I respect your legal advice, Mr. Jones, but what good is alimony on a cold night."

* * *

The young lady walked boldly up to the woman whom she took to be the matron of the hospital.

"May I see Mr. Jones, please?", she asked.

"May I ask who you are?"

"Certainly. I am his sister."

"Well, well. I'm glad to meet you. I'm his mother."

* * *

Freshman (leaving Baker lab): What's that funny smell?"

Other Freshman: That's fresh air, you sap.

* * *

Prof: Smith, wake up Jones.

Smith: Wake him up yourself. You put him to sleep.

* * *

But this one takes the solid nickel-plated chrome alloy loving cup.

One of the brilliant graduates of the E.E. School went to Niagara on a visit, and his host took him out for a walk. They came presently to the great falls but the engineer said nothing.

"Well," said his host, "ain't it a wonderful sight?"

"Ain't what a wonderful sight?" replied the engineer.

"Why that great body of water pouring over the great precipice."

The engineer considered this statement and cogitated upon it. Finally he spoke. "Well," he said, "what's to hinder it?"

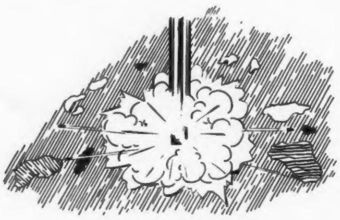
* * *

"But, officer, I didn't see that fire-plug when I parked there. It was hidden behind an airedale."

G-E Campus News

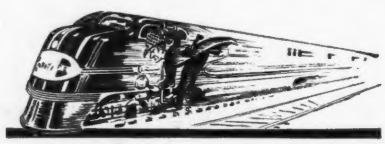
SHARPSHOOTING TWO MILES UNDERGROUND

SHOOTING HOLES through an oil-well casing at a depth of two miles underground is another problem successfully solved by electricity. The Lane-Wells Company Gun Perforator is an ingenious device used to pierce casings with steel bullets. When an oil pocket has been exhausted, the operators pierce the well casing at a different stratum, thus opening another pocket.



In order to know where to pierce the casing and how deep the gun is, G-E electric locating, weight, and depth instruments are mounted on a panel in a truck from which the shots are fired and the results recorded. Over two and one half miles of steel-sheathed cable is used to lower and fire the gun, the current for the charge being carried in the core of the cable. Accurate measurement of the depth at which the gun strikes or leaves the fluid level in the well is indicated to the operator by a weight indicator which utilizes two General Electric Selsyn motors.

In General Electric Company, numerous groups of engineers devote their entire time to the most efficient use of electricity in all types of industries. These men, former members of the Test Course, have solved many problems such as Sharpshooting Two Miles Underground.

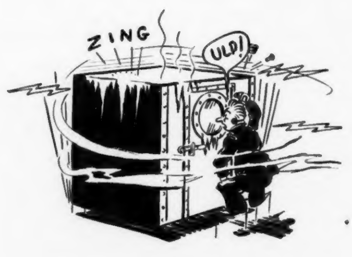


TRAIN-PERFORMANCE DETECTIVE

IN AN EFFORT to determine more accurately the performance of an electric locomotive and to calculate the most efficient motor for the train, T. F. Perkinson, R. P. I., '24, a former Test man now in the Erie Works of General Electric Company, invented a machine which performs these operations mechanically.

Computation by the step-by-step method of these calculations necessitates many hours of tedious slide-rule work; repeated adding and subtracting of time, speed, and distance increments; and reading of charts. The Transportation Calculator eliminates this work and solves the mathematics at least five times as quickly, depending upon the skill of the operator.

The Transportation Department of General Electric Company offers many opportunities to mechanical and electrical engineers in the design, construction, and production of electric locomotives, trolley cars, and trolley buses. The solutions of many interesting problems are found in this department, the Transportation Calculator being but one of them.



BOXING THE ELEMENTS

WIND, RAIN, SLEET, SNOW, arctic and tropical temperatures, six-mile altitudes, and power dives—all are found within the confines of two steel rooms in the radio-transmitter test department in the Schenectady Works of General Electric Company.

To assure perfect performance of aircraft transmitters, the equipment is placed in these two rooms where extremely severe weather conditions are simulated. Portholes of one-inch glass in the rooms permit the test men to observe the effects on the instruments without being subjected to the same strains placed upon the transmitters.

These complicated tests are made by college-trained men now on Test. The field of radio transmission from airplanes is, of course, new and progressive. The "flight rooms" provide radio engineers with a new and clearer conception of designs for radio equipment.

GENERAL ELECTRIC

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